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(22) International Filing Date: 14 December 1998 (14.12.98)		
(30) Priority Data: 9726597.9 17 December 1997 (17.12.97) GB		
(71)(72) Applicant and Inventor: TOLAND, Joseph [GB/GB]; 11 Copperfields, Horrabridge, Yelverton, South Devon PL20 7UB (GB).	Published <i>With international search report.</i>	
<b>(54) Title:</b> PNEUMATIC TYRE RIM CUTTING SYSTEM		
<b>(57) Abstract</b>		
A machine and process for removing the reinforcing beads (101) from pneumatic tyres (102) in which two co-operating cylindrical cutters (106, 110) are brought together until one cutter has passed completely through both beads (101) of the tyre so as to separate them completely from the tyre (102).		

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## PNEUMATIC TYRE RIM CUTTING SYSTEM

### Field of this Invention

The present invention relates to an apparatus for removing the total bead seat area from the sidewalls of pneumatic tyres.

### 5 Background to this Invention

In order for the material of pneumatic tyres to be recycled in some form or other, or for them to be used for fuel, it is necessary to remove the wire reinforcement core, which is contained in the edges of the tyres which contact the seating areas of wheels to which the tyres are fitted. Also, these 10 reinforcements have an intrinsic value.

10 Machines for carrying out this operation exist, some of which utilise a rotating cutter and others of which utilise a reciprocating action. The present invention is of the latter type.

An existing reciprocating vehicle tyre rim core remover is disclosed in 15 specification US 4, 355, 556. In this apparatus, which is fully automated, there are two opposed tubular cutters. Associated with the upper cutter there is a conical tyre centraliser and ejector positioned to push severed tyre beads through the lower cutter onto a conveyor belt for removal. Initially, a 20 tyre, the rim cores of which are to be removed, is placed on an annular support table, positioned approximately co-axially with the cutters by means of four equally spaced radially movable locators. The upper cutter is then lowered until the central locator contacts the edges of the tyre. Further movement of the central locator accurately centres the tyre with respect to the cutters before pressing the upper bead of the tyre firmly upon the lower 25 one which rests on the annular support. The upper cutter then descends until teeth on its lower edge mesh with corresponding teeth on the lower cutter. When severance of the rim core has been completed, the ejector is

lowered to expel the severed tyre core through the lower cutter, the upper cutter is raised and the tyre ejected from the machine, which is then ready for the next cycle.

It is the object of the present invention to provide an improved pneumatic 5 tyre rim core removal apparatus.

According to the present invention there is provided an apparatus for the removal of pneumatic tyre rim cores, comprising a pair of opposed concentric tubular cutters, means for positioning, in an operative position 10 between the cutters, a tyre, the rim beads of which are to be removed, and means for moving at least one cutter relative to the other, characterised in that the means for positioning the tyre between the cutters is adapted to urge the beads of the tyre together prior to the operation of the cutters, and the edges of the cutters are adapted to pass one within the other, thereby to 15 separate completely the rim beads of the tyre from the remainder of the tyre.

Preferably the planes of the edges of the cutters are inclined at an angle to facilitate the shearing action of the cutters. A limited amount of rotary movement may be provided for the same purpose.

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The invention will now be described, by way of example, with reference to the accompanying drawings, in which,

25 Figure 1 is a part-sectioned front view of an embodiment of the invention in a first phase of operation,

Figure 2 is a part-sectioned front view of the embodiment of Figure 1 in a second phase of operation,

Figure 3 is a part-sectioned front view of the embodiment of Figure 1 in a third phase of operation, and

5 Figure 4 is a part-sectioned front view of the embodiment of Figure 1 in a fourth phase of operation.

Referring to the drawings, a machine 100 for the removal of the reinforced beads 101 of a pneumatic tyre 102 consists of a rigid framework 103 upon which there is mounted an hydraulic ram 104 and four regularly spaced 10 subsidiary hydraulic rams 105. An annular upper cutting tool 106 is mounted on the shaft 107 of the hydraulic ram 104. The subsidiary rams 105 are connected to an annular compression ring 108 which is positioned above a tyre support bed 109, which surrounds a lower cutting tool 110. The shaft 107 of the ram 104 terminates in a guiding taper 111 which co- 15 operates with an annular guide 112 mounted on a lower bearing structure 113 which forms part of the framework of the machine 100.

Associated with the machine 100, but not illustrated, are conveyor belt systems for supplying tyres to the machine and for removing de-beaded tyres and beads, together with a system for controlling the operation of the 20 machine.

The cycle of operations is as follows:

a) Cutters 106, 109 appropriate to a size of tyre 102 to be de-beaded, are 25 selected and fitted to the machine 100. (It is not necessary always to change the compression ring 108 and tyre support bed 109 because their shapes enable them to operate with a range of tyre diameters).

b) The subsidiary rams 105 are actuated to cause the compression ring 108 to bear on the upper sidewall 114 of the tyre 102 and urge it against the lower sidewall 115 of the tyre 102 bringing the beads 101 of the tyre 102 together and forcing the lower sidewall 115 of the tyre 102 against the tyre support bed 109 and lower cutting tool 110.

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c) The main ram 104 is then actuated. Initially, the tapered guide portion 111 of the shaft 107 of the ram 104 engages the guide 112, so centralising the cutters 106 and 111, before the upper cutter 106 makes contact with the tyre 102. The downward motion of the upper cutter 106 is continued until it has passed right through the beads 101 of the tyre 102, and into the lower cutter 110, so severing the beads 101 of the tyre and causing them to fall into the space 116 inside the lower cutter 110.

10

15 The rams 104, 105 are then retracted, enabling the now de-beaded tyre 102 to be removed from the machine.

Although in the embodiment of the invention described is operated hydraulically, it can equally well be operated pneumatically or 20 mechanically.

CLAIMS

1. An apparatus for the removal of rim cores (beads) (101) from a pneumatic tyre (102), comprising two opposed tubular concentric cutters (106, 110), means (105, 108, 109) for positioning a tyre (102) the rim beads (101) are to be removed in an operative position between the cutters (106, 110) and means (104, 107) for moving at least one cutter (106) relative to the other cutter (110) characterised in that the means (105, 108, 109) for positioning the tyre (102) between the cutters (106, 110) is adapted to urge the beads (101) of the tyre (102) together prior to the operation of the cutters (106, 110), and that the cutters (106, 110) are adapted to pass one within the other thereby to separate completely the rim beads (101) from the remainder of the tyre (102).
2. An apparatus according to claim 1 characterised that at least one of the cutters (106, 110) has cutting edge the plane of which is adapted to be at an acute angle to the axis of the cutter (106, 110).
3. An apparatus according to claim 2 characterised in that only one of the cutters (106, 110) is movable and that the plane of the cutting of that cutter (106) is at an acute angle to the axis of motion of that cutter (106).
4. An apparatus according to any of claims 1 to 3 characterised in that the means (104, 107) for moving the cutters (106, 110) is adapted to impart a rotary motion as well as an axial motion to at least one of the cutters (106, 110).
5. An apparatus according to any proceeding claim characterised in that there is included means (105, 108) for urging the sidewalls (114, 115) of

the tyre (102) together prior to the cutters (106, 110) commencing the cutting operation.

6. A method of removing the rim cores (beads) from a pneumatic tyre characterised in that there is included the operations of:

- a) Placing a tyre (102) the beads (101) of which are to be removed in an annular tyre support bed (109).
- b) Urging the sidewalls (114, 115) of the tyre (102) together and against a cylindrical first cutter (110) surrounded by the tyre support bed (109).
- c) Urging a second cutter (106) axially towards the tyre (102) and the first cutter (110).
- d) Continuing the movement of the upper second cutter (106) until it has passed completely through the tyre (102) and entered the first cutter (110) thereby to sever the beads (101) from the tyre (102).

7. A method according to claim 6 characterised in that a rotary motion is applied to at least one of the cutters (106, 110) during the cutting operation.

8. A method according to claim 7 characterised in that the rotary motion is applied to the cutter (106) which is moved axially relative to the other cutter (110).

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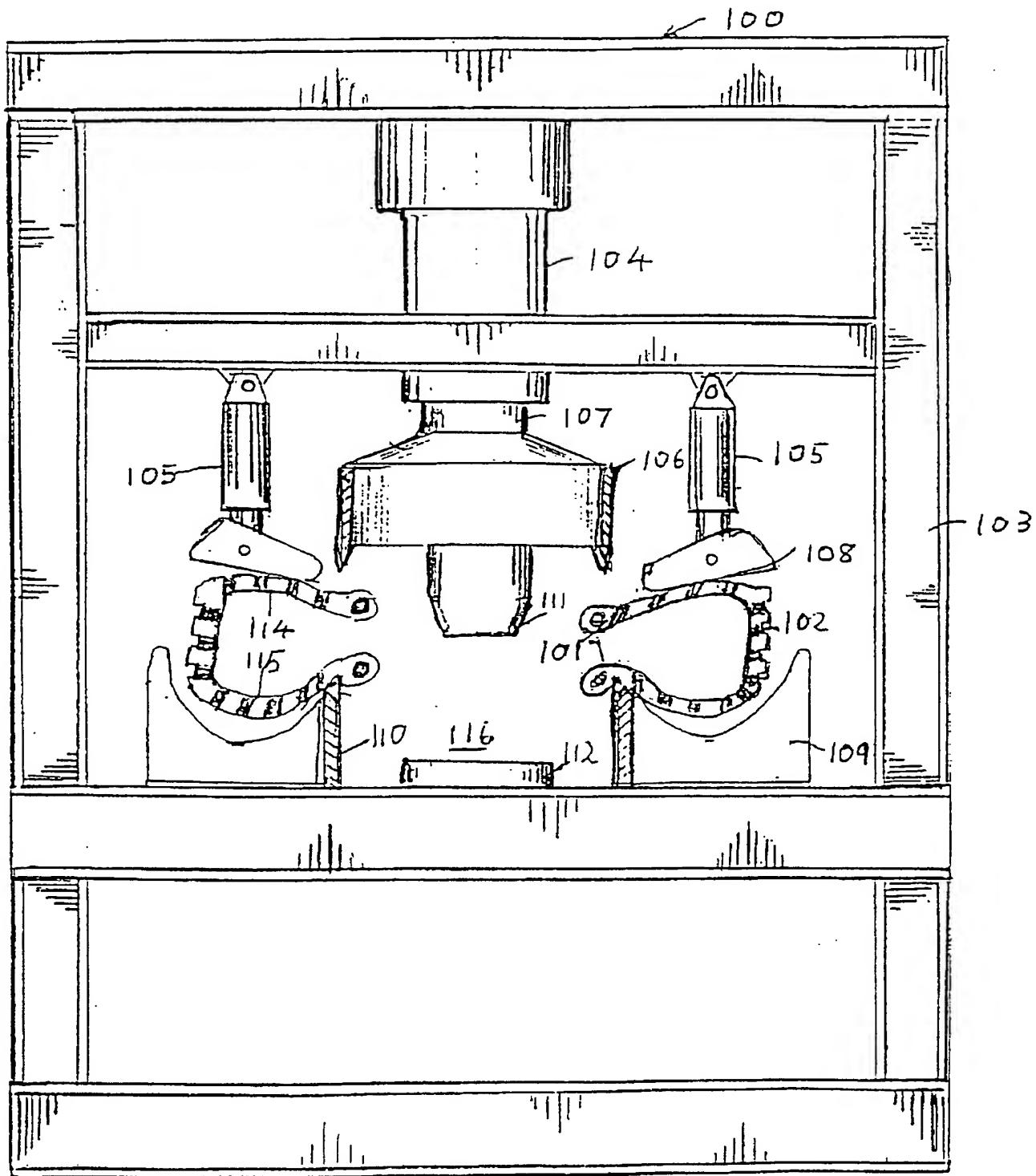


FIGURE 1

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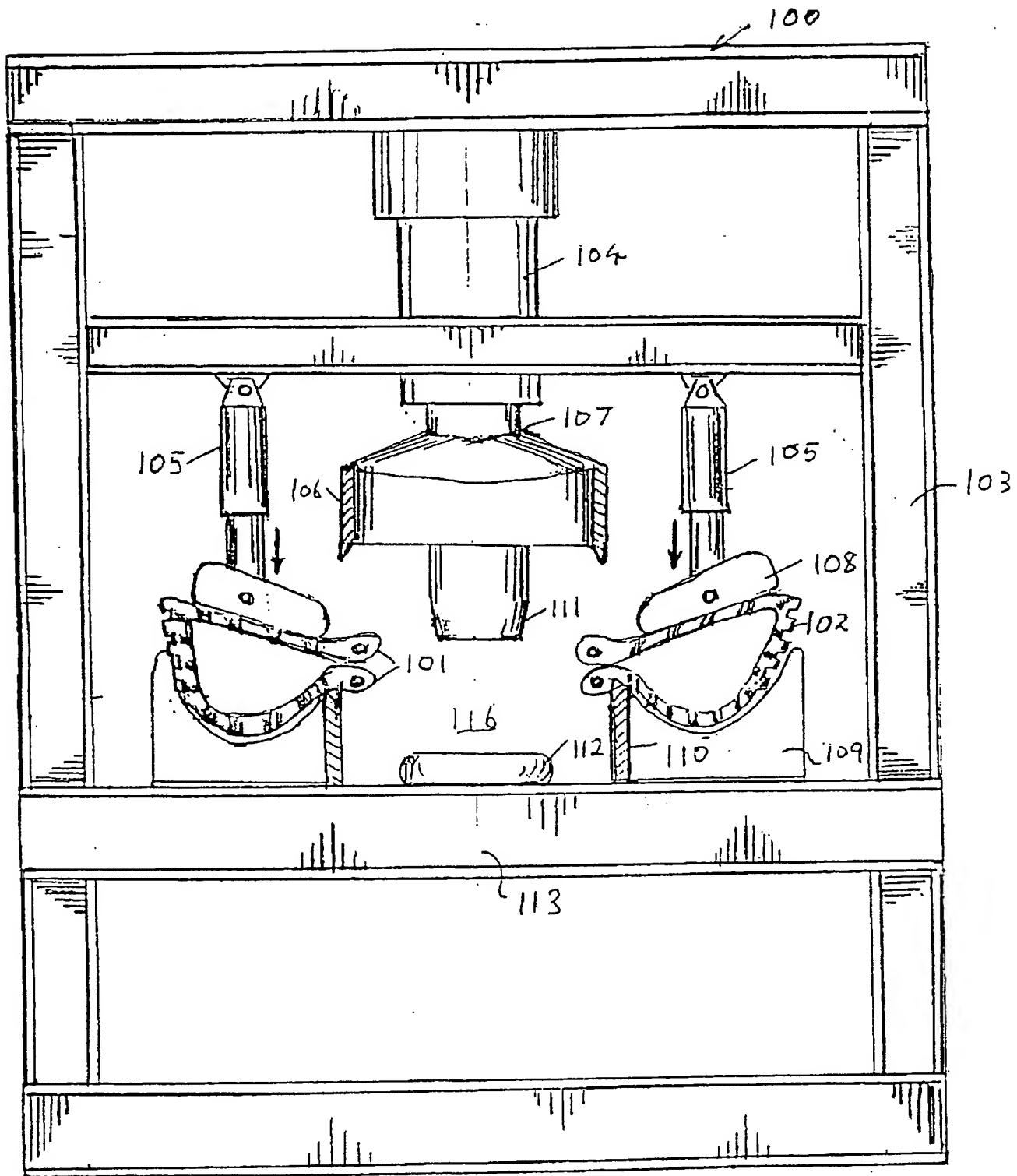


FIGURE 2

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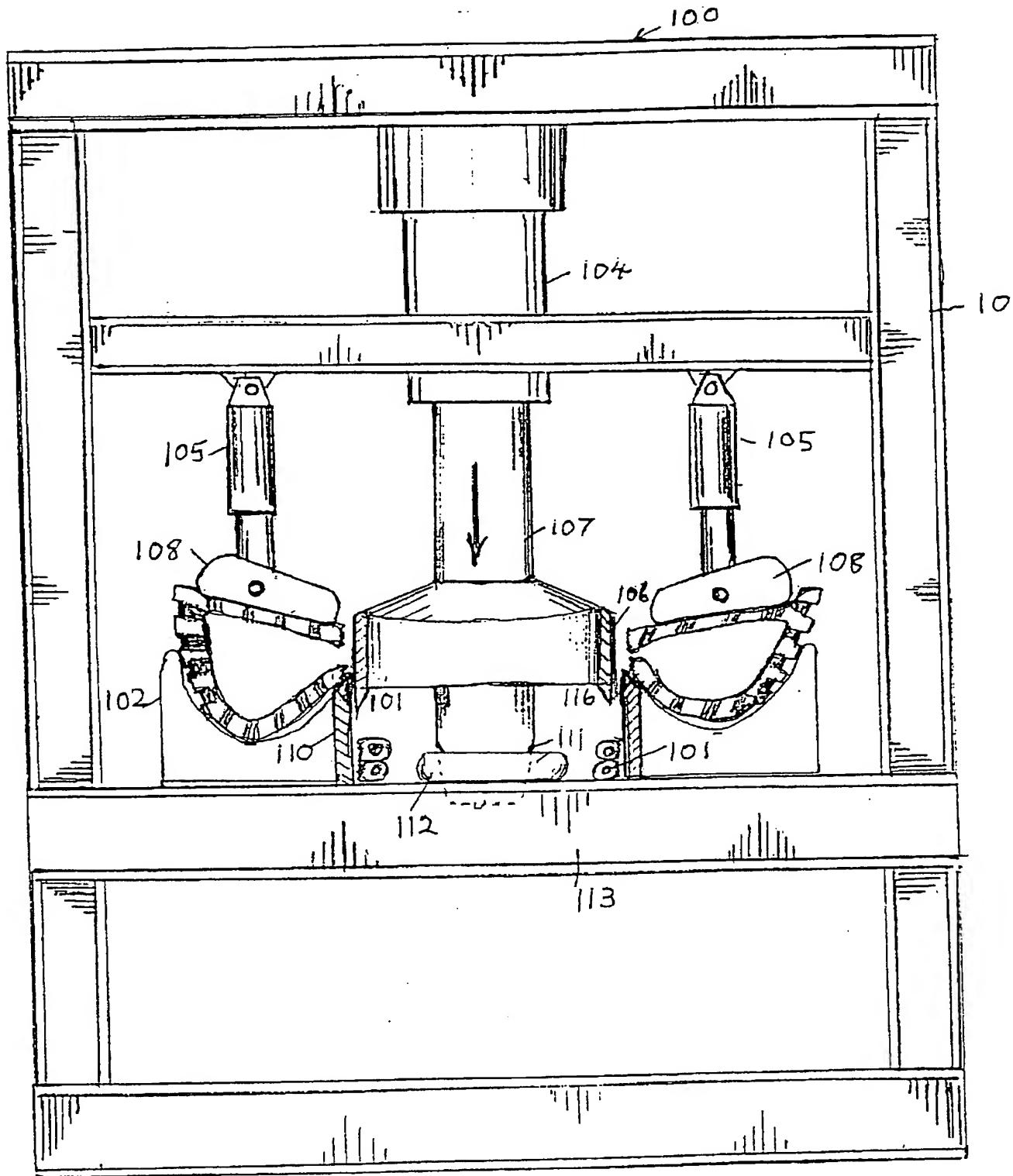


FIGURE 3

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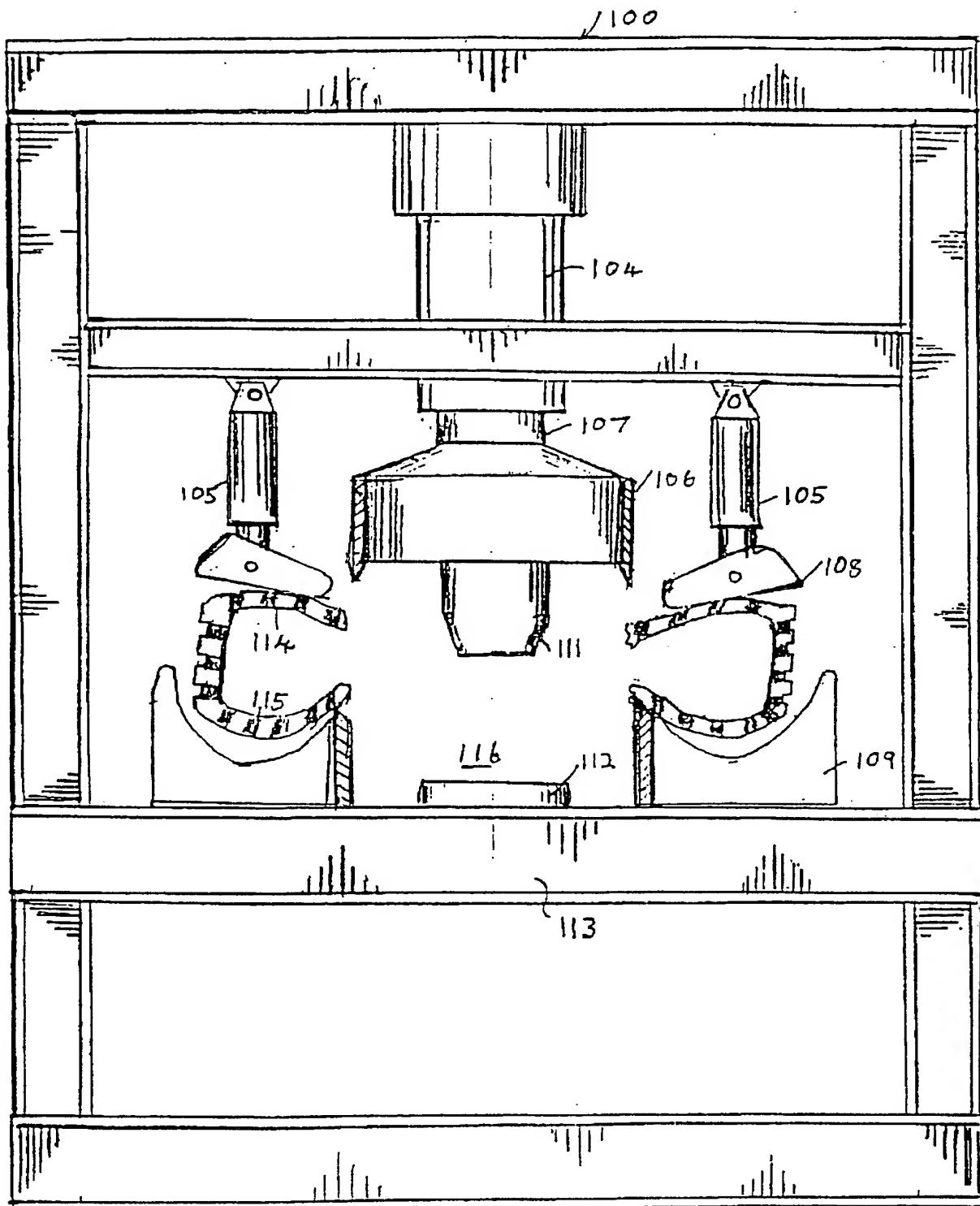


FIGURE 4

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 98/03740

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 B26D1/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 B26D B29B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 355 556 A (ULSKY CARL M) 26 October 1982 see the whole document ---	1-3,5,6
Y	DATABASE WPI Week 68 Derwent Publications Ltd., London, GB; AN 68-31285q XP002094490 & SU 216 247 A (KISELEV), 1968 see abstract ---	1-3,5,6
A	GB 1 385 392 A (TS PK I T BJURO N NOI ORGANIZA) 26 February 1975 see page 3, line 10 - line 80; figures ---	4,7,8
A	GB 1 385 392 A (TS PK I T BJURO N NOI ORGANIZA) 26 February 1975 see page 3, line 10 - line 80; figures ---	4,7,8
		-/-



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 873 759 A (BURCH ELSWARD K) 17 October 1989 see abstract; figures 6,7	5,6
A	DE 23 54 464 A (ZIEGLER GEB WOHLFARTH IRIS) 15 May 1975	

# INTERNATIONAL SEARCH REPORT

## Information on patent family members

In: International Application No:

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4355556	A 26-10-1982	JP 57080042 A	19-05-1982
GB 1385392	A 26-02-1975	NONE	
US 4873759	A 17-10-1989	NONE	
DE 2354464	A 15-05-1975	NONE	

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